AMENDMENTS TO THE CLAIMS

LISTING OF CLAIMS:

Claim 1 (Currently amended). A method of optimizing performance of a fermentation process ~~bioprocess~~ involving a complex nutrient mixture comprising:

(a) calculating a feed concentration of the complex nutrients;

(b) ~~(a)~~ periodically ~~and alternately~~ stopping a supply of each nutrient in a complex nutrient mixture to a culture of microorganisms until a metabolic activity of the microorganisms decreases by a preset percentage;

~~(b) calculating a new feed concentration of the complex nutrients;~~ and

(c) adjusting the amount of each nutrient supplied to the microorganism with an optimization routine, wherein a ratio between the feed concentration of the complex nutrients and the total quantity of the complex nutrients is treated as a separate control variable but is adjusted simultaneously.

Claim 2 (Withdrawn). A method according to claim 1, wherein the optimization routine comprises a co-ordination controller for generating control variables, a multicomponent controller, and means for controlling feed concentrations of the complex nutrients.

Claim 3 (Original). A method according to claim 1, wherein the complex nutrient mixture comprises two different nutrient mixtures.

Claim 4 (Currently amended). A method according to claim 1, wherein the optimization routine comprises:

(a) generating a flow chart with a co-ordination controller for generating control variables using a negative-pulse response technique;

(b) generating response times; and

(c) using the response times to form an ~~the~~ input variable Q_{sens}, which is obtained by dividing an actual pulse response time Δt_j by a pulse response time Δt_{j-1} in a previous cycle, measured with a respective other complex nutrient.

Claim 5 (Withdrawn). A method according to claim 2, wherein the multicomponent controller is a fuzzy-logic controller.

Claim 6 (Cancelled).

Claim 7 (Original). A method according to claim 1, wherein the microorganism is *Gluconobacter suboxydans.*

Claim 8 (Original). A method according to claim 7, wherein D-sorbitol is converted to L-sorbose.

Claim 9 (Withdrawn). A device for optimized performance of microbiological processes involving complex nutrient mixtures, wherein a supply of each nutrient is periodically and alternately stopped until a metabolic activity of a microorganism in the process decreases by a preset percentage, whereupon new feed concentrations of the complex nutrients are calculated and adjusted with an optimization routine, the device comprising

a) a reactor for performing the microbiological process with a microorganism comprising at least two individual feed lines for supplying nutrients to the reactor;

b) sensors for measuring a metabolic activity of the microorganism;

c) a co-ordination controller controlled by the sensors;

d) a multicomponent controller; and

e) elements for controlling the feed concentrations of the complex nutrients.

Claim 10 (Withdrawn). A method for optimizing production of a fermentation product comprising:

(a) Cultivating in a bioreactor a microorganism in a complex nutrient mixture using a first feed concentration;

(b) retarding the flow of a first nutrient from the mixture into the bioreactor;

(c) measuring a metabolic activity of the microorganism and maintaining the retardation of the flow of the first nutrient into the bioreactor until the metabolic activity of the microorganism decreases by a preset value;

(d) calculating a second feed concentration using an optimization routine;

(e) adjusting the first feed concentration to the second feed concentration based on the calculation in step (d); and

(f) repeating steps (a)-(e) until the nutrient mixture supplied to the microorganism is optimized for the production of the fermentation product.

Claim 11 (Withdrawn). A process according to claim 10 wherein the metabolic activity is determined by a parameter selected from the group consisting of

oxygen transfer rate, carbon dioxide transfer rate, pH, concentration of dissolved oxygen in the bioreactor, and the temperature of the bioreactor.

Claim 12 (Withdrawn). A process according to claim 10 wherein the preset value in step (c) is a decrease in the metabolic activity of about 1% to about 5%wt.

Claim 13 (Withdrawn). A process according to claim 10 wherein the optimization routine comprises a co-ordination controller for generating control variables, a multicomponent controller, and a control element for control of flow rate of the nutrients in the complex nutrient mixture into the bioreactor.

Claim 14 (Withdrawn). A process according to claim 13 wherein the multicomponent controller is a fuzzy-logic controller.

Claim 15 (Withdrawn). A process according to claim 10 wherein the complex nutrient mixture comprises at least two different complex nutrient mixtures.

Claim 16 (Withdrawn). A fermentation system wherein cultivation of a microorganism is optimized for production of a fermentation product, the fermentation system comprising:

(a) a bioreactor equipped for continuous operation;

(b) means for separating nutrients of a complex nutrient mixture into separate streams of the individual nutrients, so that the composition of the mixture that is introduced into the bioreactor may be altered during the fermentation process;

(c) means for measuring and controlling pH, pO_2, and temperature in the bioreactor;

(d) a device for measuring and controlling the amount of the nutrient mixture introduced into the bioreactor;

(e) means for controlling a feed stream of the nutrient mixture into the bioreactor and for measuring an exhaust-gas composition to provide a gas transfer rate as a measurement signal; and

(f) an automation system for controlling the fermentation system.